

12/09/99
jc714 U.S. PTO

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Atty. Docket No. 678-375 (P8639)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, D.C. 20231

UTILITY APPLICATION FEE TRANSMITTAL

jc530 U.S. PTO
09/457817
12/09/99

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): Dong-Jin LEE, Byung-Hun HWANG, Chul-Gyoo PARK

and Young-Seoung JOO

For: DEVICE AND METHOD FOR CONTROLLING RADIO MOBILE
TERMINAL CONNECTED TO HANDS-FREE KIT

Enclosed are:

☒ 8 page(s) of specification

☒ 1 page(s) of Abstract

☒ 3 page(s) of claims

☒ 4 sheet(s) of drawing(s) ☒ formal ☐ informal

☒ 2 page(s) of Declaration and Power of Attorney

☒ An Assignment of the invention to Samsung Electronics Co.
Ltd.

CERTIFICATION UNDER 37 C.F.R. § 1.10

I hereby certify that this New Application Transmittal and the documents referred to as enclosed therein are being deposited with the United States Postal Service on this date December 9, 1999 in an envelope as "Express Mail Post Office to Addressee" Mail Label Number EL393559305US addressed to: BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231.

Dated: December 9, 1999


Judge Holmberg

☒ Certified copy of application

Country

Appln. No.

Filed

Korea

1998-53952

December 9, 1998

from which priority under Title 35 United States Code,
§ 119 is claimed

☒ is enclosed.

☐ will follow.

CALCULATION OF UTILITY APPLICATION FEE

For	Number Filed	Number Extra	Rate	Basic Fee \$ 760.00
Total Claims*	5	= 0	x \$ 18.00	\$ -0-
Independent Claims	3	= 0	x \$ 78.00	\$ -0-
Multiple dependent Claims	[] yes	Add'l. Fee	\$260.00	\$ -0-
	[x] no	Add'l. Fee	None	= \$ -0-
TOTAL				<u>\$760.00</u>

☐ Verified Statement of "Small Entity" Status Under 37 C.F.R.
§ 1.27. Reduced fees under 37 C.F.R. § 1.9(f) (50% of
total) paid herewith \$_____.

☒ A check in the amount of **\$40.00** to cover the recording of
the attached Assignment is enclosed.

☒ A check in the amount of **\$760.00** to cover the
filing fee(s) is attached.

☐ Charge fee to Deposit Account No. 04-1121. Order No.
_____ TWO DUPLICATE COPIES OF THIS SHEET ARE ATTACHED.

*Includes all independent and single dependent claims and all claims referred to in multiple
claims. See 37 C.F.R. § 1.75(c).

[X] Please charge any deficiency as well as any other fee(s) which may become due under 37 C.F.R. § 1.16 and/or 1.17 at any time during the pendency of this application, or credit any overpayment of such fee(s) to Deposit Account No. 04-1121. Also, in the event any extensions of time for responding are required for the pending application(s), please treat this paper as a petition to extend the time as required and charge Deposit Account No. 04-1121 therefor. TWO DUPLICATE COPIES OF THIS SHEET ARE ATTACHED.

Date: December 9, 1999



SIGNATURE OF ATTORNEY

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. 678-375 (P8639)

First Inventor or Application Identifier Dong-Jin LEE et al.

Title Device and Method for Controlling Radio Mobile

Express Mail Label No. EL393559305US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 12]
(preferred arrangement set forth below)
- Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 4]
4. Oath or Declaration [Total Pages 2]
- a. ☒ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
- i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney
(when there is an assignee) ☐ Attorney
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☐ * Small Entity Statement(s) ☐ Statement filed in prior application,
(PTO/SB/09-12) Status still proper and desired
14. ☒ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
15. ☒ Other: Check for \$760.00 (filing fee)
Check for \$40.00 (recording fee)

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____/_____

Prior application information: Examiner _____ Group / Art Unit: _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Signature [Signature] Date 12/9/99

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

**DEVICE AND METHOD FOR CONTROLLING RADIO MOBILE
TERMINAL CONNECTED TO HANDS-FREE KIT**

PRIORITY

This application claims priority to an application entitled "Device and Method for Controlling Radio Mobile Terminal Connected to Hands-Free Kit" filed in the Korean Industrial Property Office on December 9, 1998 and assigned Serial No. 98-53952, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to power control for a radio mobile terminal connected to a hands-free kit, and in particular, to a device and method for automatically controlling power of a radio mobile terminal connected to a hands-free kit and for preventing the radio mobile terminal from malfunctioning.

2. Description of the Related Art

Typically, a hands-free kit for a radio mobile terminal is mounted in a vehicle to allow convenient, hands-free use of the radio mobile terminal. However, if the radio mobile terminal has its power switched off when connected to the hands-free kit, a user must turn on the power of the radio mobile terminal in addition to connecting the terminal to the hands-free kit. Also, if the radio mobile terminal's battery is completely discharged when connected to the hands-free kit, the user must turn on the power by pressing a power key on a keypad of the radio mobile terminal prior to making a call. Moreover, during a call, if a signal

generated by the hands-free kit is applied to a signal input terminal which is connected to the power key on the key pad of the radio mobile terminal to receive a power-on or power-off signal, a communication path is cut off, ending the call.

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SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a device and method for automatically switching on power of a radio mobile terminal connected to a hands-free kit.

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It is another object of the present invention to provide a device for preventing malfunction of a radio mobile terminal, which may be generated during a call as a voltage of a hands-free kit is applied to a signal input terminal of the radio mobile terminal.

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To achieve these and other objects of the present invention, there is provided a power control device for automatically turning on power of a radio mobile terminal connected to a hands-free kit, including a power control signal generator in the radio mobile terminal for generating a power control signal to supply power to the radio mobile terminal, a signal output terminal connected to the power control signal generator, for generating a driving signal to enable the power control signal generator, and a signal input terminal connected to a power key of the radio mobile terminal, for receiving a power-on signal; and the hands-free kit including a power-on signal generator connected through a connector between the power key and the signal input terminal, for generating the power-on signal, a signal detector connected through the connector between the signal output terminal and the power control signal generator, for detecting the driving

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signal generated by the signal output terminal, and a controller for controlling the power-on signal generator to generate the power-on signal depending on whether the driving signal generated by the signal output terminal is detected through the signal detector.

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BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

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FIG. 1 is a schematic block diagram illustrating a power control device for preventing a radio mobile terminal connected to a hands-free kit from malfunctioning during a call in accordance with an embodiment of the present invention;

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FIG. 2 is a circuit diagram illustrating the power control device of FIG. 1;

FIG. 3 is a circuit diagram illustrating a power control device for controlling power of a radio mobile terminal connected to a hands-free kit in accordance with another embodiment of the present invention; and

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FIG. 4 is a flow chart illustrating the operation of the power control device of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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Preferred embodiments of the present invention will be described hereinbelow with reference to the accompanying drawings. In the following description, numerous specific details are set forth to provide a more thorough understanding of the present invention. It will be apparent, however, to one skilled

in the art the present invention may be practiced without these specific details. In other instances, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

5 Generally, a hands-free kit is connected to a radio mobile terminal through a curl cord or connector. Within the curl cord, lines RX-AUDIO, TX-AUDIO, DC-GROUND, CF (Current Feedback), and HP-POWER are connected to the radio mobile terminal. In the present invention, the HP-POWER line is used for power control.

10 FIG. 1 illustrates a power control circuit for preventing a radio mobile terminal from malfunctioning when the radio mobile terminal is connected to a hands-free kit while making a call.

15 Referring to FIG. 1, a power control signal generator 100 generates a power control signal to supply power to the radio mobile terminal. A signal output terminal 140 is connected to the power control signal generator 100 and generates a driving signal for enabling the power control signal generator 100. A signal input terminal 130 is connected to a switch 120 on a keypad of the radio mobile terminal and receives a power on/off signal. A switching circuit 150 has an input terminal connected to a terminal for connecting the hands-free kit and has an output terminal connected between the signal output terminal 140 and the power control signal generator 100 and between the switch 120 and the signal input terminal 130. The switching circuit 150 is enabled or disabled by the driving signal provided from the signal output terminal 140. A controller (not shown) controls the signal output terminal 140 to generate the driving signal according to a signal applied to the signal input terminal 130.

Typically, the radio mobile terminal uses a dual purpose key having two functions, one being power control, in order to reduce the area occupied by the keypad. For instance, the radio mobile terminal shares a power key on the keypad with a communication path cutoff key. If the user presses an END/POWER key on the keypad for a long time, the switch 120 turns on/off the power. If the user presses the END/POWER key during a call, the switch 120 ends the call. The signal generated through the switch 120 is applied to the signal input terminal 130 in the controller (not shown) to turn the power on or off or to end a call. If the signal generated through the switch 120 is a power on signal, the driving signal is generated through the signal output terminal. The driving signal is applied to the power control signal generator 100 to cause the power control signal generator 100 to operate. The power control signal generator 100 provides the power control signal to a power supply (not shown) so as to supply the power to the radio mobile terminal.

In the prior art, if the radio mobile terminal is connected to the hands-free kit while making a call, the HP-POWER line of the hands-free kit is connected between the signal output terminal 140 and the power control signal generator 100 and between the switch 120 and the signal input terminal 130. Then a signal of the HP-POWER line is applied to the signal input terminal 130 and the communication path is cut off, ending the call.

In the present invention, however, the switching circuit 150 prevents such a malfunction. The switching circuit 150 is enabled or disabled by the driving signal provided from the signal output terminal 140. When disabled, the switching

circuit 150 prevents the signal generated by the hands-free kit 200 from being switched to the radio mobile terminal.

FIG. 2 is a detailed circuit diagram of the power control device of FIG. 1. An NPN transistor Q1 is used in the power control signal generator 100. The switching circuit 150 includes a first resistor R11 interposed between a terminal for connecting the hands-free kit 200 and ground. The switching circuit 150 also includes a second resistor R12 interposed between the hands-free kit terminal and the signal output terminal 140, and includes a PNP transistor Q2 having an emitter connected to the hands-free kit terminal and a collector connected between the signal output terminal 140 and the power control signal generator 100. The switching circuit 150 further includes a third resistor R13 interposed between a base of the transistor Q2 and output terminal 140.

If the signal output terminal 140 is logic "high", that is, if the driving signal is generated, the transistor Q2 is turned off and thus the signal applied to the HP-POWER line is cut off. Since the radio mobile terminal is switched on during a call, the driving signal for controlling the power of the radio mobile terminal becomes logic "high".

FIG. 3 illustrates a power control device for controlling the power of a radio mobile terminal connected to a hands-free kit according to another embodiment of the present invention.

Referring to FIG. 3, the radio mobile terminal includes a power control signal generator 100 for generating a power control signal to supply power to the radio mobile terminal. A signal output terminal 140 is connected to the power

control signal generator 100 and generates a driving signal for enabling the power control signal generator 100. A signal input terminal 130 is connected to a switch 120 (power key) and receives a power-on signal. The hands-free kit includes a power-on signal generator 220 connected through a connector (curl cord) between the switch 120 and the signal input terminal 130 to generate the power-on signal. The hands-free kit also includes a signal detector 230 connected through the connector between the signal output terminal 140 and the power control signal generator 100 to detect the driving signal provided from the signal output terminal 140. The hands-free kit further includes a controller 210 for controlling the power-on signal generator 220 to generate the power-on signal depending on whether the driving signal generated by the signal output terminal 140 is detected through the signal detector 230.

FIG. 4 is a flow chart illustrating the operation of the power control device of FIG. 3.

Referring to FIG. 4, the controller 210 of the hands-free kit determines if the radio mobile terminal is connected to the hands-free kit at step 400, by sensing whether two DC-ground terminals of the hands-free kit are shorted by the radio mobile terminal. If the radio mobile terminal is connected to the hands-free kit, the controller 210 directs the power-on signal generator 220 to generate the power-on signal for a predetermined time period (about 300 ms) at step 410. The power-on signal is the same as the signal generated through the switch 120 to drive the power control signal generator 100. The controller 210 directs the power-on signal generator 220 to stop generating the power-on signal at step 420. The controller 210 then checks through the signal detector 230 whether the driving signal is generated by the signal output terminal 140 at step 430. The power-on signal

generated through step 410 is then applied to the signal input terminal 130 and a controller (not shown) of the radio mobile terminal detects the power-on signal as a power-on command. Typically, if the switch 120 is pressed for a prescribed time period, the power is switched on. Similarly, if the power-on signal is applied to the signal input terminal 130 for a prescribed time period, the controller of the radio mobile terminal determines that the power-on command is received. The controller of the radio mobile terminal then directs the signal output terminal 140 to generate the driving signal. If the power of the radio mobile terminal is switched on, the signal output terminal 140 generates a logic "high" signal (i.e., driving signal) and the radio mobile terminal is maintained at a power-on state. It can be determined whether the radio mobile terminal is switched on by detecting the driving signal with the signal detector 230. If the radio mobile terminal is in a power-on state, the controller 210 directs the power-on signal 220 to stop generating the power-on signal at step 440. If the radio mobile terminal is not in a power-on state at step 430, when no driving signal is detected, the controller 210 returns to step 410.

In the second embodiment of the present invention described with reference to FIGs. 3 and 4, the controller 210, power-on signal generator 220 and signal detector 230 may be comprised of a single chip, and the signal detector 230 may be connected to a GPIO (General Purpose Input Output) port of the chip.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A power control device for automatically turning on power to a radio mobile terminal connected to a hands-free kit, comprising:

5 a circuit in said radio mobile terminal comprising a power control signal generator for generating a power control signal to supply power to said radio mobile terminal, a signal output terminal connected to said power control signal generator, for generating a driving signal to enable said power control signal generator, and a signal input terminal connected to a power key of said radio mobile terminal, for receiving a power-on signal; and

10 a circuit in said hands-free kit comprising a power-on signal generator connected between said power key and said signal input terminal, for generating said power-on signal, a signal detector connected between said signal output terminal and said power control signal generator, for detecting said driving signal generated by said signal output terminal, and a controller for controlling said power-on signal generator to generate said power-on signal depending on whether said driving signal generated by said signal output terminal is detected through said signal detector.

20 2. A power control method for automatically turning on power to a radio mobile terminal connected to a hands-free kit, a circuit in said radio mobile terminal including a power control signal generator for generating a power control signal to supply power to said radio mobile terminal, a signal output terminal for generating a driving signal to enable said power control signal generator, and a signal input terminal connected to a power key of said radio mobile terminal, for receiving a power-on signal, and circuit in said hands-free kit including a power-on signal generator connected between said power key and said signal input

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terminal, for generating said power-on signal, and a signal detector connected between said signal output terminal and said power control signal generator, for detecting said driving signal generated by said signal output terminal, said method comprising the steps of:

5 supplying said power-on signal to said signal input terminal for a predetermined time period through said power-on signal generator when said radio mobile terminal is connected to said hands-free kit;

 determining if said driving signal generated by said signal output terminal is detected through said signal detector; and

10 terminating said power-on signal upon detection of said driving signal.

3. The power control method as claimed in claim 2, further comprising the step of returning to said step of supplying said power-on signal if said driving signal is not detected.

15 4. A power control device for preventing malfunction of a radio mobile terminal connected to a hands-free kit during a call, comprising:

 a power control signal generator for generating a power control signal to supply power to said radio mobile terminal;

20 a signal output terminal connected to said power control signal generator, for generating a driving signal to enable said power control signal generator;

 a signal input terminal connected to a power key on a key pad of said radio mobile terminal, for receiving a power on/off signal;

25 a switching circuit having an input terminal connected to said hands-free kit and having an output terminal connected between said signal output terminal and said power control signal generator and between said power key and said

signal input terminal, wherein said switching circuit is enabled or disabled according to said driving signal provided from said signal output terminal; and

a controller for controlling said signal output terminal to generate said driving signal according to said power on/off signal applied to said signal input terminal.

5 5. The power control device as claimed in claim 4, wherein said switching circuit includes:

 a first resistor interposed between said hands-free kit and ground;

10 a second resistor interposed between said hands-free kit and said signal output terminal;

 a PNP transistor having an emitter connected to the hands-free kit and a collector connected between said signal output terminal and said power control signal generator; and

15 a third resistor interposed between a base of said PNP transistor and said signal output terminal.

ABSTRACT

A device and method for automatically controlling power of a radio mobile terminal connected to a hands-free kit and for preventing the radio mobile terminal from malfunctioning. In a power control method for automatically turning on a radio mobile terminal connected to a hands-free kit, the radio mobile terminal including a power control signal generator, a signal output terminal and a signal input terminal, the hands-free kit including a power-on signal generator and a signal detector, a power-on signal is supplied to the signal input terminal for a predetermined time period through the power-on signal generator when the radio mobile terminal is connected to the hands-free kit. After the predetermined time period elapses, generating the power-on signal is stopped. It is determined if the driving signal generated by the signal output terminal is detected through the signal detector. If the driving signal is detected, generating the power-on signal is stopped.

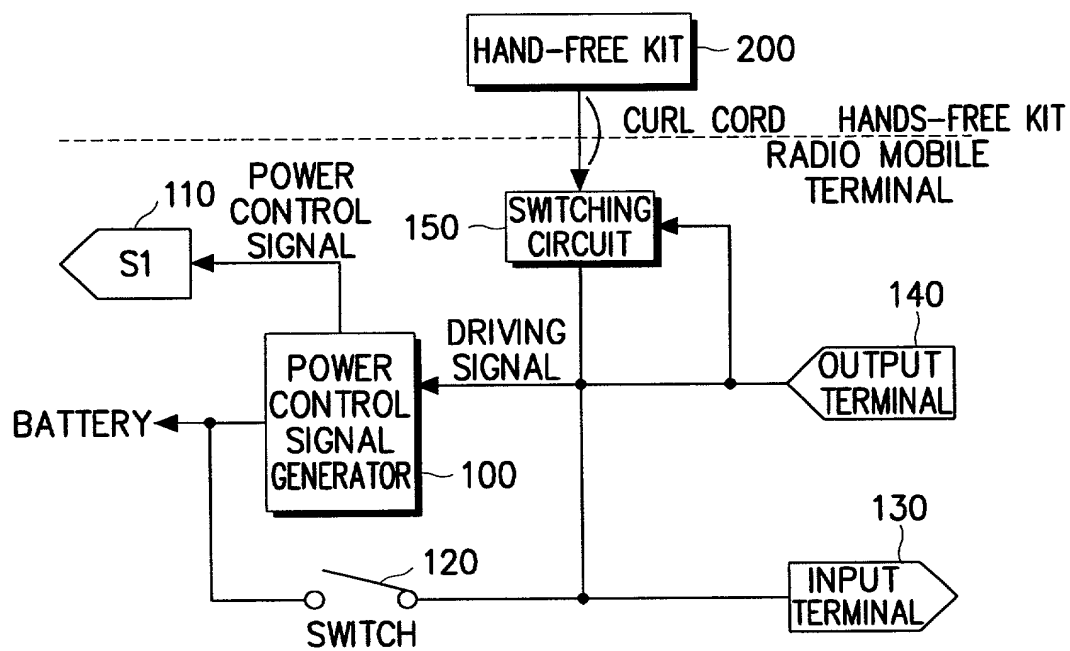
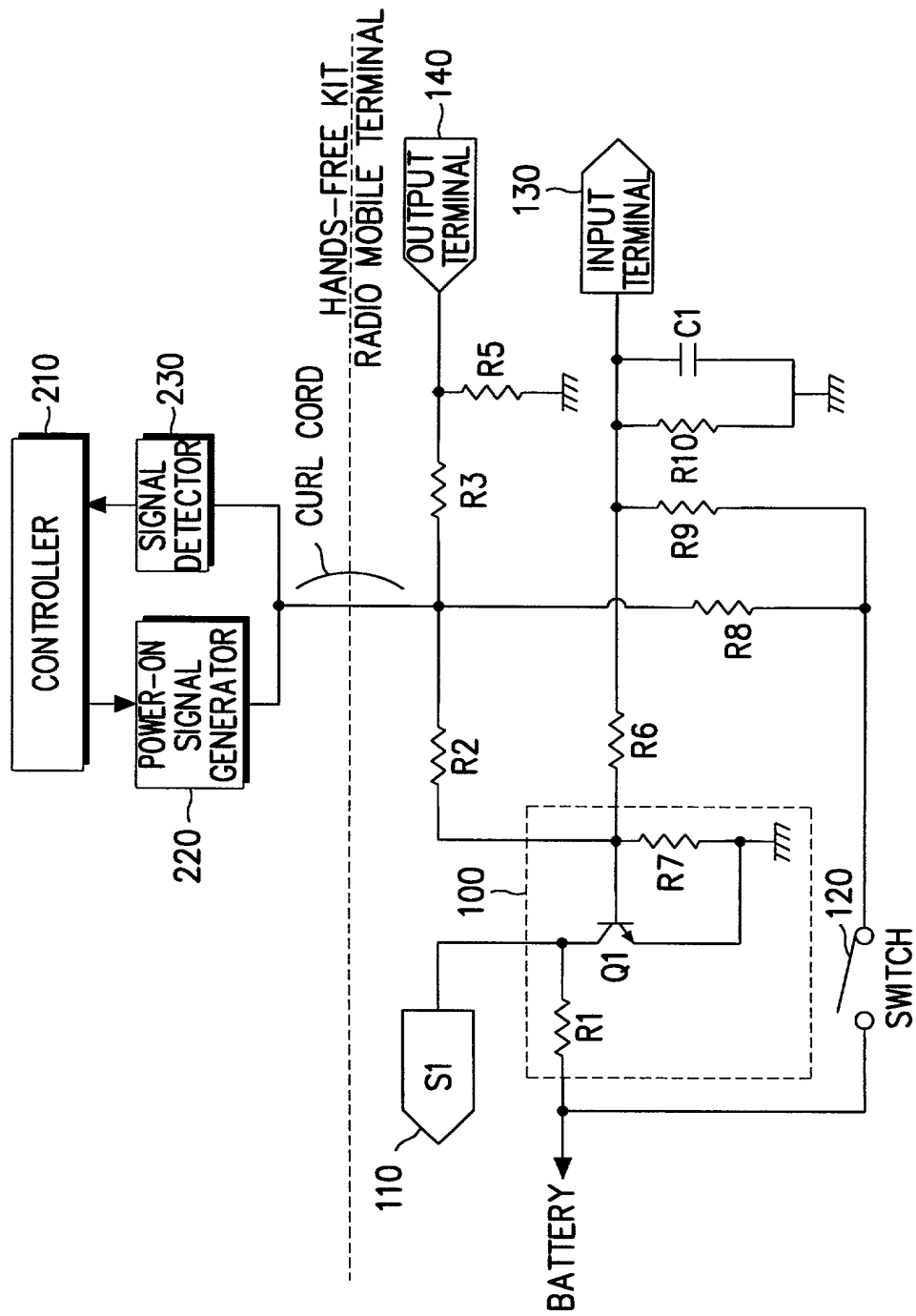


FIG. 1

FIG. 3



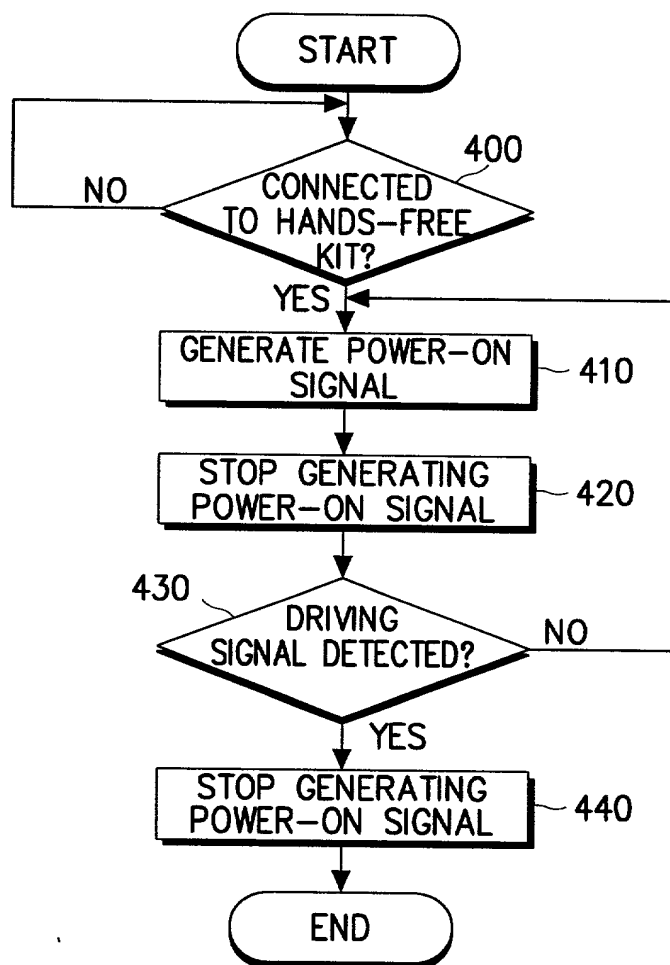


FIG. 4

DECLARATION

Docket No. 678-375 (P8639)

AS A BELOW NAMED INVENTOR, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name

I believe that I am the original, first and sole (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below), of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE: DEVICE AND METHOD FOR CONTROLLING RADIO MOBILE TERMINAL CONNECTED TO HANDS-FREE KIT

the specification of which either is attached hereto or indicates an attorney docket no. 678-375 (P8639), or:

☐ was filed in the U.S. Patent & Trademark Office on _____ and assigned Serial No. _____.

☐ and (if applicable) was amended on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability and to the examination of this application in accordance with Title 37 of the Code of Federal Regulations §1.56. I hereby claim foreign priority benefits under Title 35, U.S. Code §119(a)-(d) or §385(b) of any foreign application(s) for patent or inventor's certificate, or §385(a) of any PCT international application which designated at least one country other than the United States, or §119(e) of any United States provisional application(s), listed below and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>1998-53952</u>	<u>Korea</u>	<u>09/12/1998</u>	Priority Claimed: Yes [X] No []
(Application Number)	(Country)	(Day/Month/Year filed)	
_____	_____	_____	Yes [] No []
(Application Number)	(Country)	(Day/Month/Year filed)	

I hereby claim the benefit under Title 35, U.S. Code, §120, of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, U.S. Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, The Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application Serial Number)	(Filing Date)	(STATUS: patented, pending, abandoned)
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(Application Serial Number)	(Filing Date)	(STATUS: patented, pending, abandoned)
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I hereby appoint the following attorneys: PETER G. DILWORTH, Reg. No. 28,450; ROCCO B. BARRESE, Reg. No. 25,253; DAVID M. CARTER, Reg. No. 30,949; PAUL J. FARRELL, Reg. No. 33,484; PETER DELUCA, Reg. No. 32,878; JEFFREY B. STEEN, Reg. No. 32,063; ADRIAN T. CALDERONE, Reg. No. 31,746; GEORGE M. KAPLAN, Reg. No. 29,375; JOSEPH W. SCHMIDT, Reg. No. 36,920; RAYMOND E. FARRELL, Reg. No. 34,818; RUSSELL R. KASSNER, Reg. No. 38,183; CHRISTOPHER G. TRAINOR, Reg. No. 39,517; GEORGE LIKOURFZOR, Reg. No. 40,067; JAMES M. LOEFFLER, Reg. No. 37,873; EDWARD C. MEAGHER, Reg. No. 41,100; SUSAN L. HESS, Reg. No. 37,360; MICHAEL P. DILWORTH, Reg. No. 37,311; PETER B. SORELL, Reg. No. 44,349, and GLENN D. SMITH, Reg. No. 42,158, each of them of DILWORTH & BARRESE, 333 Earle Ovington Boulevard, Uniondale, New York 11553 to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith and with any divisional, continuation, continuation-in-part, reissue or re-examination application, with full power of appointment and with full power to substitute an associate attorney or agent, and to receive all patents which may issue thereon, and request that all correspondence be addressed to:

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Uniondale, New York 11553
Tel. No.: (516) 228-8484

I HEREBY DECLARE that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 U.S. Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature: [Signature] Date: 9 December 1999
Residence & Post Office Address: Hansin APT. 110-802, Ingye-dong, Paltal-gu, Suwon-shi, Kyonggi-do, Korea

FULL NAME OF SECOND JOINT INVENTOR: Byung-Hun ~~WANG~~ HWANG Citizenship Korea

Inventor's signature: [Signature] Date: 9 December 1999
Residence & Post Office Address: #897, Maetan-dong, Paltal-gu, Suwon-shi, Kyonggi-do, Korea

FULL NAME OF THIRD JOINT INVENTOR: Chul-Gyoo PARK Citizenship Korea

Inventor's signature: [Signature] Date: 9 December 1999
Residence & Post Office Address: Samik APT. 104-308, Suji-up, Yongin-shi, Kyonggi-do, Korea

FULL NAME OF FOURTH JOINT INVENTOR: Young-Sang JOO Citizenship Korea

Inventor's signature: [Signature] Date: 9 December 1999
Residence & Post Office Address: #20-9, Panpo-dong, Socho-gu, Seoul Korea

FULL NAME OF FIFTH JOINT INVENTOR: _____ Citizenship _____

Inventor's signature: _____ Date: _____
Residence & Post Office Address: _____

FULL NAME OF SIXTH JOINT INVENTOR: _____ Citizenship _____

Inventor's signature: _____ Date: _____
Residence & Post Office Address: _____